Concerning the Neogeophilidae, with Proposal of a New Genus.[1] (Chilopoda: Geophilomorpha: Neogeophilidae)

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(*Continued from p. 159*)

Cryptostrigla silvestri, new species

Holotype: ♀. Guatemala: Department of Alta Verapaz, Semococh (according to O. F. Cook's note, about 48 km. southeast of Coban). G. P. Goll, leg. U. S. National Museum catalogue of myriapod types: 2606; chilopod type C-147; see slides StC: 76 and 77.

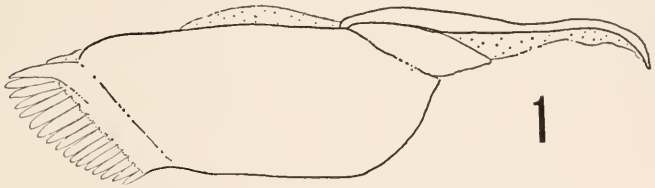
Introductory. Length, about 32 mm. Pedal segments, 69. Body shape: Essentially of uniform width, the final 4–5 segments slightly attenuate. Color: Considerably discolored from long immersion in alcohol, hence uniformly sordid light brown.

Antennae. Each is broken; left with 5 articles, right with 4 articles. Each basal article much wider than long, the remaining articles approximately as long as greatest width. Vestiture evidently becoming suddenly denser on the fifth article. Cephalic Plate. Greatest length, 0.544 mm; greatest width, 0.579 mm, thus somewhat wider than long. Shape: Anteriorly broadly pointed, the two sides meeting to form an obtuse angle; laterally strongly, evenly excurved; posterior margin essentially straight. Areolation coarse. Without frontal or other sutures or sulci. Setae short and sparsely disposed. A narrow, central portion of the prebasal plate is exposed. Clypeus (Fig. 6). Paraclypeal sutures nearly straight; complete (not curving postero-laterally as in Silvestri's figure of *primus*). Setae, few, as shown; prelabral setal pair absent. Clypeal areas and plagulae absent; areolation coarse and essentially uniform. Each bucca well-defined by strong sutures; each with a weak transbuccal suture; anteriorly with a few small setae. Labrum (Fig. 6). Consisting of one obscure, weak, hyaline, undivided piece

that projects posteriorly in a gentle convex arc; labral teeth very short and delicate, hyaline. Labrum continuous on each side with a delicately sclerotized bar (part of the clypeus) that meets each labral fultura. MANDIBLE (Fig. 1). Shaft relatively short; body of the mandible relatively long and massive; distally with a row of simple hyaline teeth, these very long and flat, rather blunt. FIRST MAXILLAE (Fig. 2). Coxosternum completely divided medially into right and left halves; lappets absent. Each coxosternal half surmounted by a broad, lobelike structure (which may represent a highly modified telopodite); each lobelike structure apically with an indistinct membranous area but otherwise without sutures, divisions, etc.; lappets absent. SECOND MAXILLAE (Fig. 2). Coxosternum medially rather narrow, neither divided nor suturate midlongitudinally; postero-laterally somewhat extended; entire posterior margin weakly areolate and regionally membranous; metameric pore openings conspicuous. Telopodite consisting of three distinct articles; basal article entirely without dorsal and ventral condyles; third article rather ovate in outline; apical claw short and broad, pointed, not excavate, anterior edge smooth but posterior edge with about 3 sharp teeth, thus giving claw superficially a bifid appearance (Fig. 8).

PROSTERNUM (Fig. 3). Very broad. Pleuroprosternal sutures complete, terminating dorsolaterally. Abortive subcondylic sclerotic lines present, these continuous with the pleuroprosternal sutures posteriorly but not passing to or toward their respective prehensorial condyles. Anterocentrally with a pair of obscure but well-sclerotized and rounded denticles. PREHENSORS (Fig. 3). When flexed, falling far short of anterior cephalic margin. Denticles absent on all articles. Ungula long and extraordinarily straight, falciform; dorso-ventrally very flat, bladelike; posterior edge finely dissected to form about 6 tiny, irregular serrations. Poison calyx located at upper end of trochanteroprefemur, cordiform in shape; its duct passing along anterior edge of ungula to open far short of apex. Poison gland very long, passing out of trochanteroprefemur, apparently extending posteriorly nearly as far as 1st pedal segment.

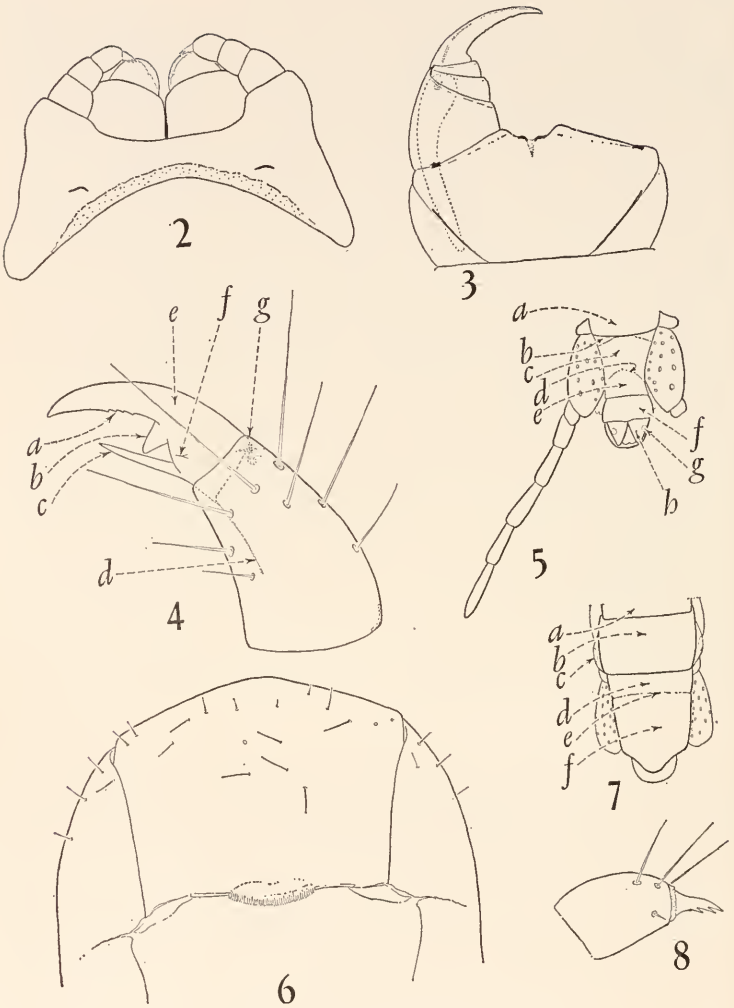
Tergites. Basal plate anteriorly weakly concave to reveal a small portion of prebasal plate centrally. Remaining tergites coarsely areolate, very sparsely setose; without sulci. Pleurites. Agreeing closely with those of *E. mexicanus* (Silvestri's Figs. 1–5, p. 357). Paratergites absent. Spiracles on anterior third of body weakly horizontally elliptical, thereafter becoming rounder. Legs (except ultimates). First legs only slightly shorter and thinner than those following. All legs short and notably robust, not becoming longer or less robust posteriorly on body. Setae short and sparse but more numerous than on tergites and sternites. Pretarsi (Fig. 4): Each fundamentally consisting of a rather bulbous base and a prominent claw proper;



Cryptostrigla silvestri, new species, holotype.

1. Left mandible (inner surface).

claws proper from the 1st through the 33rd each with a conspicuous antero-ventral, ventrally directed tooth, tooth of 1st pretarsus small, thereafter ventral teeth increasing in size, becoming smaller again on the 31st and 32nd pretarsi; each tooth-bearing pretarsus with minute serrations on the ventral edge of claw proper; each pretarsus (1–68) with two basal accessory spines, the posterior always minute, the anterior very robust and long on those pretarsi with ventral teeth (on 1 through 33), thereafter becoming smaller and thinner. Sternites. Sulci, sutures, carpophagus-structures, porefields, depressions, metasternite projections all absent. Setae short and sparse. Areolation weak. On anterior third of body the intersternites are weakly divided midlongitudinally; on posterior two-thirds of



Explanation of Figures

Cryptostrigla silvestri, new species, holotype.

2. First and second maxillae (ventral aspect, setae deleted).
3. Prosternum and right prehensor (ventral aspect).
4. Pretarsus and tarsus of 14th left leg (posterior surface, all setae shown). a, minute serrulations on plantar edge of claw proper. b, ventral tooth of claw proper. c, hypertrophic anterior accessory spine. d,

body intersternites become wider anteroposteriorly, more band-like; undivided centrally.

Ultimae Pedal Segment (Figs. 5, 7). Pretergite intimately fused with tergite proper; the suture separating them is persistent but vestigial and weak; pretergite evidently without pleurites. Tergite: Greatest length exceeds greatest width; sides nearly parallel, weakly convergent; posterior margin medially extended to form a blunt point, the two sides (of the rear margin) thus forming an obtuse angle. Presternite intimately fused with sternite, the vestigial suture separating them is present but discernible with difficulty. Sternite: Sides weakly convergent; the *true* posterior margin medially very deeply excavate, the two corners extended posteriorly in long sharp points; the sternite intimately fused with the pregenital sternite, the intervening suture barely discernible but persistent. Coxopleuron: Moderately inflated; dorsally, laterally and ventrally with small, irregularly disposed freely-opening pores; without porepits of parasternital fossae; setae short and very sparse. Leg: Notably longer and thinner than penult leg; with 6 articles distal to coxopleuron; setae short and somewhat more numerous than on other legs; tarsus consisting of two articles, the distotarsus slightly longer than the proximotarsus; pretarsus represented by a minute sclerotic point (seen only at 645 ×), hence an unguiform or tuberculate pretarsus is absent.

(in dashes) depressor tendon of the pretarsus. e, claw proper of the pretarsus. f, minute, atrophied posterior accessory spine. g, (in dashes) condyle of pretarsus.

5. Ultimate pedal segment and postpedal segments (ventral, setae deleted). a, penultimate pedal sternite. b, presternite of ultimate pedal segment. c, ultimate pedal sternite. d, vestigial, extremely obscure but persistent suture separating the true ultimate pedal sternite (c) and the pregenital sternite (e). e, pregenital sternite. f, genital sternite. g, (in dashes) concealed terminal pore. h, gonopod.

6. Clypeus, labrum, and right and left buccae (ventral aspect, all setae shown).

7. Rear body segments (dorsal aspect, setae deleted). a, pretergite of penultimate pedal segment. b, tergite of penultimate pedal segment. c, last spiracle of left side. d, pretergite of ultimate pedal segment. e, obscure transverse suture separating pretergite (d) and tergite (f). f, tergite of ultimate pedal segment.

8. Third article and claw of 2nd maxillary right telopodite (ventral aspect, all setae shown).

Postpedal Segments (Fig. 5). Pregenital sternite anteroposteriorly very long, passing forward to and fusing intimately with the ultimate pedal sternite from which it is separated by a vestigial, obscure suture, thereby causing the last pedal sternite to appear much longer than it actually is. Each gonopod is conical, long; entirely without a discernible interarticular suture or other indication of division, hence is secondarily uniarticulate. Terminal pores present, small, concealed.

On the Rank and Possible Affinities of the Neogeophilidae.—The real importance of the discovery of this specimen derives from the unusual opportunity it affords for the direct examination of a member of this peculiar and systematically unsettled group. Careful examination of the animal testifies to the thoroughness of Silvestri's morphological diagnosis; as we have seen, the accuracy of his report is questioned pertinent only to four points, none of which would alter Silvestri's original contention that the group is suprageneric in rank. However, my examination of the single specimen, together with a careful reconsideration of Silvestri's published data, at this time do not permit any other *confident* conclusion than his own, that the rank of the group is probably suprageneric. For reasons explained below it seems preferable for the time-being to regard the neogeophilids as members of a distinct, aberrant family within what I shall call the geophilid-sogonid-gonibregmatid complex of families.

It seems clear that, while belonging to this family complex, the neogeophilids appear to be referable to no one of these families, at least as they are currently defined. At the same time, many of the neogeophilid structures *individually* are reminiscent often of closely similar counterparts that are discernible within this great suprafamilial section of the Geophilomorpha.

The problem of determining the rank and affinities of the Neogeophilidae is by no means reducible merely to one of deciding which is the best and most reasonable of several alternatives in the light body of well-understood and digested morphological information whose details are familiar to everyone. On the contrary, the interpretive problem is necessarily super-

imposed and dependent upon a much more formidable one in this case: many of the most critical facts upon which our inductions must depend are actually representative of a persistent legacy of deficient information which is further complicated by frequent breakdowns in interpersonal understanding. First, there are huge gaps in our knowledge of the full spectrum of the Geophilomorpha: certainly, many groups and species still await discovery. Secondly, in the case of the majority of recognized groups and species we must remain ignorant of the nature, or even of the existence, of many critical diagnostic features if, as is often unavoidable, we must depend for full, precise information upon published descriptions. Finally, it is not infrequently true that even when critical features are treated, their explication is so loose and imprecise, so subjective and cryptic, or even so faulty as to preclude the reader's gaining an accurate or sufficiently detailed understanding of them.

These several difficulties create a particular problem for the categorical assessment and group assignment of the neogeophilids whose conceivable closest relatives as groups are themselves often systematically unsettled, descriptively obscure, and evidently poorly known in terms of the species and supraspecific groups that exist but are undiscovered. The particular problem that is posed is how to interpret the structures about which we believe we have reasonably accurate, meaningful information under these circumstances. Specifically, are these presumably homeomorphic structures evolutionarily conservative, being derivative from a single and immediate preexisting source, or are some or all of them convergent and polyphyletic, having been derived independently, compelled alike by adaptive pressures in separately evolving, remotely-related lines?

Under the circumstances, and with reference to the Neogeophilidae, it seems impossible to settle this question now. We do not know enough about a sufficient number of structures and structural complexes. We do not know enough about the geophilidiform centipedes to be able to distinguish between convergencies and immediately derived structures and forms. At the same time, it is desirable to make mention of some homeo-

morphic characters that eventually may or may not prove to signify close phylogenetic linkages between the neogeophilids and certain other geophilidiform groups.

In general body habitus the Neogeophilidae bear an undeniable resemblance to the Sogonidae and some resemblance to the Dignathodontidae, although their overall similarity, e.g., in head and body shape, to the latter may well be only superficial and adaptively convergent.

A rather homogeneous, poorly-known assemblage of geophilid-like centipedes, the sogonids, apparently are restricted to the more northern New World tropics and to adjacent parts of North America where they are evidently incursive from the south. Established as a family and almost entirely described by Professor Chamberlin, the Sogonidae are clearly abundant in the neotropics where many new groups and species probably await discovery. Like the neogeophilids, they are all small, delicate creatures. Tiny short heads, delicate prehensors, simple and apparently vestigial labra,[2] simple mandibles and, reportedly in some sogonids, aberrant maxillary configurations suggest a general similarity whose explanation on the grounds of immediate evolutionary derivation, however, can hardly be very convincing in our present state of knowledge. Nonetheless, while differing in several critical features, the two groups, as

[2] The sogonid labrum has been inaccurately described repeatedly. Originally Chamberlin described it as being ". . . of a single piece apparently free laterally but fused in the middle; . . ." (1912, p. 432). Completely misinterpreting Professor Chamberlin's statement, Attems wrote the following in his key to families (1929, p. 27): "Oberlippe aus einem ungeteilten Stück bestehend." The first description is cryptic, the second erroneous. On the one hand, they are suggestive of the single, or unipartite, type of labrum, such as that labral type that is characteristic of the schendylids or himantariids. On the other hand, they fail to stress what is really significant, that the sogonid labrum is fundamentally of the tripartite geophilid type, departing from it in the apparent direction of degeneracy. In *Sogona minima* there are two prominent sidepieces which are relatively well-developed, discrete, and widely-separated. Most importantly, the midpiece has either atrophied entirely, or else it has fused imperceptibly with the broadly intruded midclypeal extension. In summary: We can only describe the sogonid labrum as being fundamentally tripartite and lacking a *distinguishable* midpiece.

we know them of course, do appear superficially to be rather similar. It is difficult to ignore the possibility, however remote, that the neogeophilids and sogonids may represent closely-related, aberrant evolutionary experiments that were fragmented together from some ancient geophilid stock. Similarly, the dignathodontids and aphilodontine geophilids perhaps represent separate and now nominate variations upon an original, basic geophilid theme.

The first maxillary coxosternum of the neogeophilids, being totally divided into right and left halves, is curiously suggestive of its homologue in *Himantosoma,* a genus that Attems placed in Gonibregmatidae but which Verhoeff regarded as the basis of a separate family. Again, whether these divided coxosterna are merely convergent or are evolutionarily derivative from a common precursor is impossible to determine now. It may, however, be significant that *Himantosoma* lacks the bizarre anterior maxillary lobes that signalize all known neogeophilids.

As I have noted above, the neogeophilid labrum appears by direct inspection to be simple and degenerate and reminiscent of that of the sogonids, inasmuch as that is also evidently hypertrophied. This is not to imply that they resemble each other very closely; they do not. At the same time, essentially the neogeophilid type of labrum may be seen in certain Gonibregmatidae. For that matter, the same labral type is found in certain ballophiline Schendylidae, which do not seem very closely related to the whole section of the Geophilomorpha here under discussion. Without much doubt, quite similar, if not occasionally identical, labra have arisen *independently* at least in some unrelated geophilomorphs.

The neogeophilid mandible, equipped only with a simple row of delicate hyaline and homogeneous teeth, apparently can tell us little, except that the neogeophilids *may be* more closely related to the geophilid-dignathodontid-gonibregmatid-sogonid complex than to any other. But even in this regard we are hardly entitled to conclude with an emphatic finality that this simple type of mandible *in every instance* can only be indicative of monophyletic origins. It is by no means impossi-

ble that, let us say, through convergency, or by whatever mechanism, the simple geophilidiform mandibles was developed independently in remotely related geophilomorphs. If we ignore the venerable mandibular criterion momentarily, then several rather striking structural similarities existing between the neogeophilids and oryids could possibly take on new significance.[3]

The neogeophilid pretarsi are evidently unique. The extraordinary ventral teeth, hypertrophic anterior accessory spines, and serrulate plantar edges must function as a unit to facilitate traction upon or adherence to the surfaces over which their possessors move. Analogous, though evidently not wholly homologous, adaptive devices are known to occur in some other geophilomorphs. For instance, the gonibregmatid genus *Eucratonyx,* while lacking a ventral pretarsal tooth, has a conspicuously introrse claw proper which, in conjuction with a hypertrophic anterior accessory spine, probably affords a firmer foothold for locomotion over rough surfaces or for stationary clinging. Again, massive development of the claw proper and of one or both of its accessory spines has been noted in certain schendylids (e.g., *Pectiniunguis*). It seems quite likely that cryptophiles such as these geophilomorphs would be inclined to evolve efficient hold-fast devices independently: their existence depends upon adaptation to a variety of crevice-cranny habitats wherein, one would think, adaptive pressures would place a premium upon the ability to squeeze through tight, narrow confines and to anchor firmly against forceful removal by predators.

Summing up: The structures that signalize the known Neogeophilidae tell us little conclusively about their interfamilial affinities. Many of these structures could very well represent adaptive convergencies that obscure rather than illuminate the ranks and affinities of groups. While most individual neogeophilid features have often quite similar counterparts in various other geophilomorph groups, in no case is there a concordance of structural identities that could justify an unequivocal statement

[3] By the same token, if we ignore the mandibular criterion, a number of features in certain oryids suggest possibilities that have not received serious consideration.

of close phylogenetic affinity at this time. It is conceivable that the neogeophilids and sogonids could reflect a community of descent, although, admittedly, this is a highly speculative suggestion for which present evidence is limited and frankly unconvincing.

A Review of the Neogeophilidae

Neogeophilidae

Neogeophilinae, Silvestri, 1918, p. 352.
Neogeophilidae, Attems, 1926, p. 365.

Distinguishing Criteria.—1st maxillary coxosternum completely divided into right and left halves, each half surmounted by a large, uniarticulate lobe. Pretarsi of the more anterior legs each ventrally with a prominent tooth that is continuous with the claw proper. First article of second maxillary telopodite basally without condyles.

Extended Characterization.—Antennae slightly attenuate distally. Cephalic plate very slightly wider than long to slightly longer than wide; frontal suture absent. Prebasal plate at least slightly exposed. Clypeus with complete paraclypeal sutures; without clypeal areas or plagulae. Labrum comprising a delicate undivided bar, wholly amalgamated with postero-central clypeus, with delicate hyaline teeth, these long, flat, rather blunt; proximal shaft relatively short when compared with the longer, heavier distal dentigerous portion. First maxillae: Coxosternum medially completely divided, the right and left sides thus entirely discrete; each coxosternal half with a large lobate structure in place of the usual structures; lappets absent. Second maxillae: Coxosternum medially undivided, not suturate; teleopodite basal articles without discernible condyles; apical claw with a few delicate spiniform projections arising from posterior edge. Prosternum with complete pleuroprosternal sutures; with or without complete subcondylic sclerotic lines. Prehensors: When closed falling far short of anterior cephalic margin; articles without denticles; ungulae long and falcate, flattened dorso-ventrally, posterior edge finely, irregularly serrulate.

Tergites not sulcate. Paratergites absent. Legs robust and short. Pretarsi of the more anterior legs each with a conspicuous ventral tooth and equally conspicuous hypertrophic anterior accessory spine. Sternites not sulcate; without porefields or carpophagus-structures; the more posterior intersternites broadly bandlike and not suturate midlongitudinally. Ultimate pedal segment: Pretergite either separated from its tergite by a distinct transverse suture, or, if fused intimately with tergite, separated from it by an obscure suture or else apparently without an intervening suture. Coxopleuron with freely opening pores, without dorsal or ventral porepits or porigerous fossae; moderately inflated. Sternite either distinguishable from or intimately fused with the pregenital sternite; ultimate tarsus uniarticulate in the males, biarticulate in the females; pretarsus essentially absent. Terminal pores present but concealed. Each gonopod biarticulate (with persistent intervening suture), or uniarticulate (without intervening suture).

Range: Known only from Mexico and Guatemala.

Known from three monotypic genera, as follows.

NEOGEOPHILUS Silvestri

Neogeophilus Silvestri, 1917, p. 352.

Type-species: *Neogeophilus primus* Silvestri, 1917. (Original designation and monotypic.)

Diagnosis.—With the characters of the family, of which the following signal characters are distinctive. (1) Head slightly longer than wide. (2) Paraclypeal sutures apparently arching outward, apparently not terminating on the rear clypeal margin (see discussion under foregoing Notes). (3) Prosternal denticles absent. (4) Prosternal subcondylic sclerotic lines passing to and esesntially meeting their respective condyles. (5) Ultimate pedal pretergite and tergite, and sternite and pregenital sternite separated by distinct sutures. (6) Female gonopods biarticulate.

Inclusive species: Known only from *N. primus* Silvestri: with the characters of the genus, in addition ♂ with 81 pedal

segments, 34 mm. long; only known and type locality, Cuernava, State of Morelos, Mexico.

EVALLOGEOPHILUS Silvestri

Evallogeophilus Silvestri, 1917, p. 355.

Type-species: *Evallogeophilus mexicanus* Silvestri, 1917. (Original designation and monotypic.)

Diagnosis.—With the characters of the family, of which the following signal characters are distinctive. (1) Head considerably longer than wide. (2) Paraclypeal sutures terminating posteriorly on the rear clypeal margin. (3) Prosternal denticles present. (4) Prosternal subcondylic sclerotic lines passing to and essentially meeting their respective condyles. (5) Ultimate pretergite and tergite, and sternite and pregenital sternite intimately fused, apparently without intervening sutures. (6) Female gonopods biarticulate.

Inclusive species: Known only from *E. mexicanus* Silvestri: with the characters of the genus, in addition ♂ with 63, ♀ with 67 pedal segments; to 30 mm. long; only known and type locality, "Jalapa" (in full, Jalapa Enriquez), State of Veracruz, Mexico.

CRYPTOSTRIGLA, new genus

Type-species: *Cryptostrigla silvestri,* new species. (Present designation and monotypic.)

Diagnosis.—With the characters of the family, of which the following signal characters are distinctive. (1) Head somewhat wider than long. (2) Paraclypeal sutures terminating on clypeal margin. (3) Prosternal denticles present. (4) Prosternal subcondylic sclerotic lines abortive, not passing across prosternal corner to or toward their respective condyles. (5) Ultimate pretergite and tergite, and sternite and pregenital sternite intimately fused, the intervening sutures still discernible. (6) Each female gonopod single, the two articles having fused without trace of intervening suture.

Inclusive species: Known only from *C. silvestri,* new species:

with the characters of the genus; in addition ♀ with 69 pedal segments, 32 mm. long.; only known and type locality, Semococh, Department of Alta Verapaz, Guatemala.

References

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Supplementary Records of Meloid Beetles (Coleoptera) of the West Indies

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Since the completion of our report on the Meloidae of the West Indies (Selander and Bouseman, 1960, Proc. U. S. Nat. Mus., vol. 111, pp. 197–226), we have received from Patricia and Charles Vaurie, American Museum of Natural History (AMNH), a series of specimens collected by them in 1960 on the islands of Guadeloupe, Jamaica, and Martinique and from M. W. Sanderson, Illinois Natural History Survey (INHS), a series of specimens collected by him in 1959 on Cuba. A few other specimens of West Indian meloids have also come to our attention. In publishing the records of this supplementary material, we again take pleasure in acknowledging the cooperation of our colleagues.

In order to avoid repetition, we will list here the localities and dates for the Vaurie material. Guadeloupe: Domaine Duclos, 600 ft., June 24–28 and July 7; Les Saintes, Terre de Haut,